

## ARTIFACT SHEET

Enter artifact number below. Artifact number is application number + artifact type code (see list below) + sequential letter (A, B, C ...). The first artifact folder for an artifact type receives the letter A, the second B, etc..

Examples: 59123456PA, 59123456PB, 59123456ZA, 59123456ZB

09434736 ZA

Indicate quantity of a single type of artifact received but not scanned. Create individual artifact folder/box and artifact number for each Artifact Type.

☐

CD(s) containing:

computer program listing

Doc Code: Computer

pages of specification

and/or sequence listing

and/or table

Doc Code: Artifact

content unspecified or combined

Doc Code: Artifact

☐

Artifact Type Code: P

☐

Artifact Type Code: S

☐

Artifact Type Code: U

☐

Stapled Set(s) Color Documents or B/W Photographs

Doc Code: Artifact

Artifact Type Code: C

☐

Microfilm(s)

Doc Code: Artifact

Artifact Type Code: F

☐

Video tape(s)

Doc Code: Artifact

Artifact Type Code: V

☐

Model(s)

Doc Code: Artifact

Artifact Type Code: M

☐

Bound Document(s)

Doc Code: Artifact

Artifact Type Code: B

☐

Confidential Information Disclosure Statement or Other Documents marked Proprietary, Trade Secrets, Subject to Protective Order, Material Submitted under MPEP 724.02, etc.

Doc Code: Artifact

Artifact Type Code X

☒

Other, description:

U.S. Priority Document

Doc Code: Artifact

Artifact Type Code: Z

# 20

The  
United  
States  
of  
America



The Commissioner of  
Patents and Trademarks

*Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.*

*Therefore, this*

United States Patent

*Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.*

*If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.*

*If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to any statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extension.*

*Bruce Lehman*

Commissioner of Patents and Trademarks

*Pandra J. Morton*

Attest



US005683938A

**United States Patent** [19]

Kim et al.

[11] **Patent Number:** 5,683,938[45] **Date of Patent:** Nov. 4, 1997[54] **METHOD FOR FILLING CONTACT HOLES WITH METAL BY TWO-STEP DEPOSITION**[75] **Inventors:** Sang Young Kim; Yung Wook Song; Hun Do Kim, all of Seoul, Rep. of Korea[73] **Assignee:** Hyundai Electronics Industries Co., Ltd., Kyoung Ki-Do, Rep. of Korea

5,000,818	3/1991	Thomas et al.	437/192
5,063,175	11/1991	Broadbent	437/195
5,069,749	12/1991	Gutierrez	437/192
5,071,789	12/1991	Nakata	437/192
5,084,414	1/1992	Manley et al.	437/192
5,100,817	3/1992	Cederbaum et al.	437/245
5,124,780	6/1992	Sandhu et al.	437/192
5,128,278	7/1992	Harada et al.	437/192
5,470,791	11/1995	Suguro et al.	437/192

**FOREIGN PATENT DOCUMENTS**

0165320	12/1981	Japan	437/189
0034929	2/1990	Japan	437/192
2-231714	9/1990	Japan	

**OTHER PUBLICATIONS**

S. Wolf, "Silicon Processing For The VLSI Era, vol. 2", Lattice Press, 1990, pp. 201-205.

*Primary Examiner*—John Niebling*Assistant Examiner*—Thomas G. Bilodeau*Attorney, Agent, or Firm*—Merchant, Gould, Smith, Edell, Welter & Schmidt, P.A.

[57]

**ABSTRACT**

Method for filling contact holes with metals by two-step deposition of selective tungsten layer is disclosed. The selective tungsten thin films are deposited in two steps, thus maximizing the contact filling with tungsten, gaining a stability of metal wires with better step coverage, and enhancing the reliability on semiconductor element.

**5 Claims, 3 Drawing Sheets****Related U.S. Application Data**

[63] Continuation of Ser. No. 964,362, Oct. 21, 1992, abandoned.

[30] **Foreign Application Priority Data**

Oct. 21, 1991 [KR] Rep. of Korea ..... 91-18500

[51] **Int. CL<sup>6</sup>** ..... H01L 21/28[52] **U.S. Cl.** ..... 437/192; 437/195; 437/981[58] **Field of Search** ..... 437/192, 195, 437/189, 190, 981[56] **References Cited****U.S. PATENT DOCUMENTS**

4,764,484	8/1988	Mo	437/203
4,804,560	2/1989	Shioya et al.	427/125
4,906,593	3/1990	Shioya et al.	437/192
4,956,313	9/1990	Cote et al.	437/195
4,987,099	1/1991	Flanner	437/245

